Model predictions

Tong

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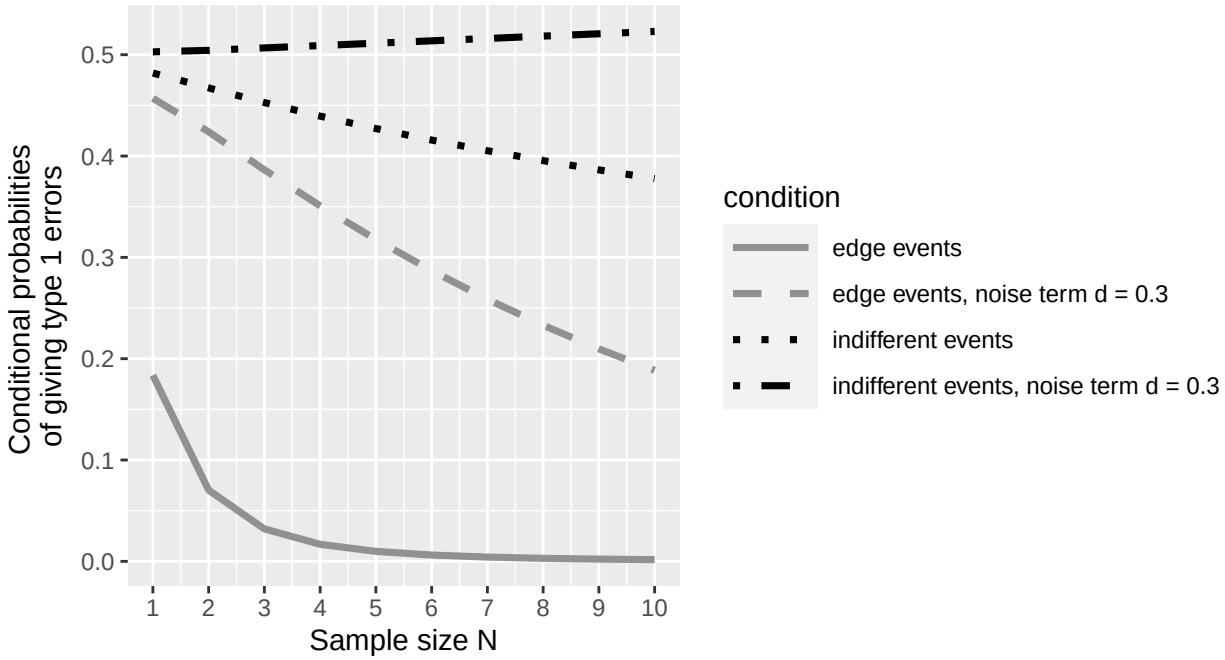
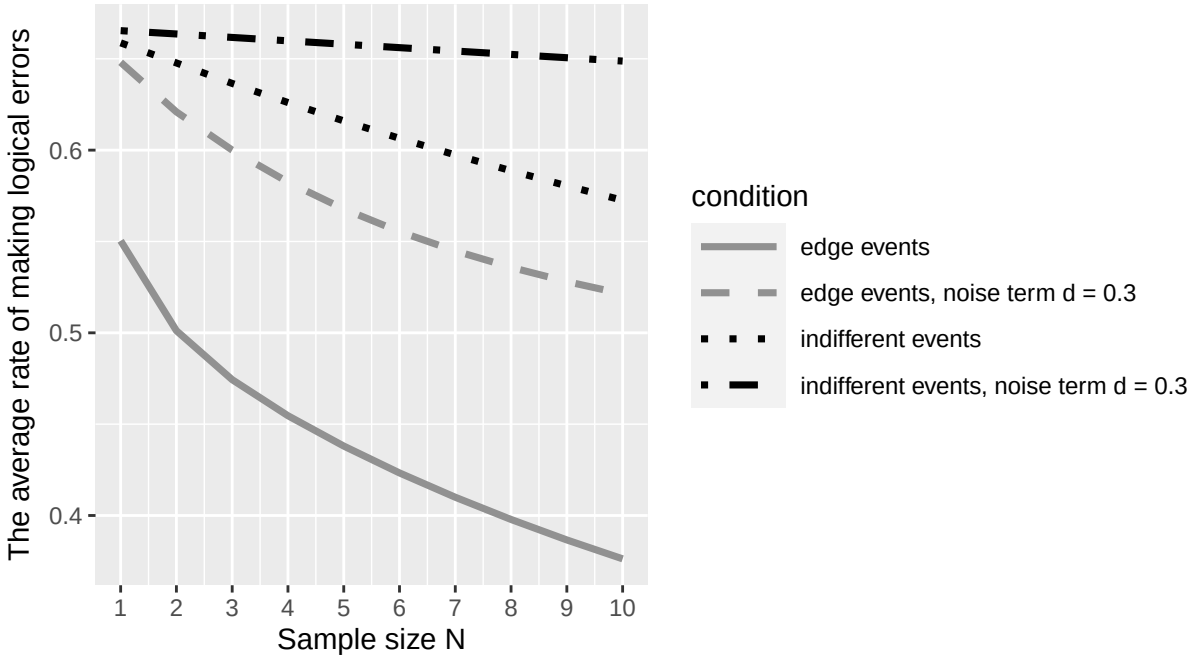
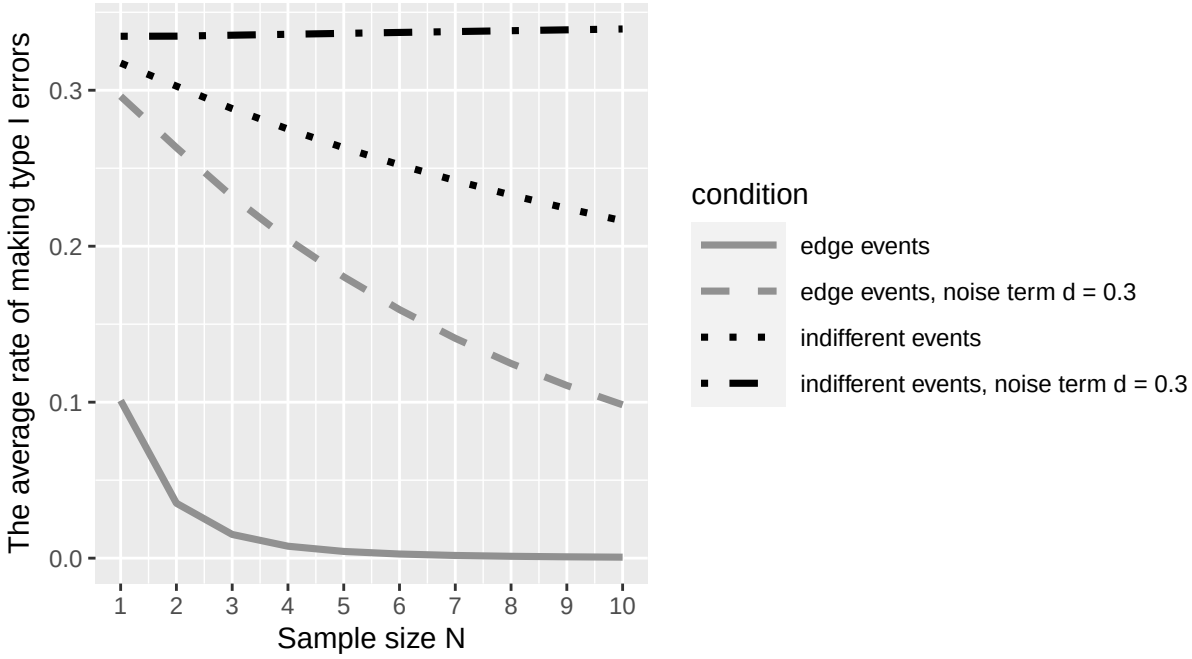
1.Predictions of conditonal probabilities of giving type 1 errors



2. Predictions we derived before:





Below are the simulated data. Column X represents the sample size.

This is the simulation result for the case where participants rank extreme events only and we set the noise term d to 0 in this case.

```
##    prob_wrong   prob_type1 conditional_prob_type1
## 1   0.5503872 0.1010689424            0.183632436
## 2   0.5011495 0.0352256274            0.070289659
## 3   0.4743517 0.0151891215            0.032020801
## 4   0.4546161 0.0076509317            0.016829434
## 5   0.4380142 0.0043126420            0.009845895
## 6   0.4233043 0.0026446156            0.006247552
## 7   0.4099912 0.0017309248            0.004221858
```

```
## 8   0.3978183 0.0011930410            0.002998960
## 9   0.3866193 0.0008575175            0.002217989
## 10  0.3762705 0.0006380442            0.001695706
```

This is the simulation result for the case where participants rank extreme events only and we set the noise term d to 0.3 in this case.

```
##    prob_wrong prob_type1 conditional_prob_type1
## 1   0.6480790 0.29614265              0.4569546
## 2   0.6209327 0.26321694              0.4239057
## 3   0.6000140 0.23183156              0.3863769
## 4   0.5824963 0.20439445              0.3508940
## 5   0.5677974 0.18036279              0.3176534
## 6   0.5553856 0.15933996              0.2868997
## 7   0.5448368 0.14094262              0.2586878
## 8   0.5358139 0.12483085              0.2329743
## 9   0.5280448 0.11070754              0.2096556
## 10  0.5213094 0.09831451              0.1885915
```

This is the simulation result for the case where participants rank indifferent events only and we set the noise term d to 0 in this case.

```
##    prob_wrong prob_type1 conditional_prob_type1
## 1   0.6587259  0.3174401              0.4819001
## 2   0.6477188  0.3026306              0.4672253
## 3   0.6365181  0.2882006              0.4527768
## 4   0.6260619  0.2750887              0.4393954
## 5   0.6160214  0.2631182              0.4271251
## 6   0.6064749  0.2521613              0.4157819
## 7   0.5973811  0.2420970              0.4052639
## 8   0.5887169  0.2328206              0.3954712
## 9   0.5804526  0.2242426              0.3863237
## 10  0.5725605  0.2162860              0.3777522
```

This is the simulation result for the case where participants rank indifferent events only and we set the noise term d to 0.3 in this case.

```
##    prob_wrong prob_type1 conditional_prob_type1
## 1   0.6653986  0.3345981              0.5028536
## 2   0.6635985  0.3346663              0.5043205
## 3   0.6616969  0.3352950              0.5067199
## 4   0.6598415  0.3358709              0.5090175
## 5   0.6579683  0.3364636              0.5113675
## 6   0.6561068  0.3370472              0.5137078
## 7   0.6542534  0.3376214              0.5160407
## 8   0.6524120  0.3381833              0.5183585
## 9   0.6505834  0.3387321              0.5206590
## 10  0.6487688  0.3392672              0.5229401
```

Study1_preliminary_analysis

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2021-10-27

I ran an ANOVA model to investigate whether the rates of giving logically incorrect responses differ when participants ranked only extreme events and when they ranked only indifferent events.

The dependent variable is if one makes logical errors in the response or not. If yes, we record the response as 1, and if no, we record the response 0. We have a between-subject condition: if ties are allowed versus if ties are not allowed. And we have a within-subject condition: if one ranks only extreme events versus if one only ranks indifferent events.

There are significant main effects of between-subject conditions and within-subject conditions. Participants on average are more likely to make logical errors when ranking indifferent events and participants are more error-prone in tied conditions.

```
a1 <- aov_ez("ID", "logical_pass", data_clean,  between = "condition", within  = "con")
```

```
## Converting to factor: condition
```

```
## Contrasts set to contr.sum for the following variables: condition
```

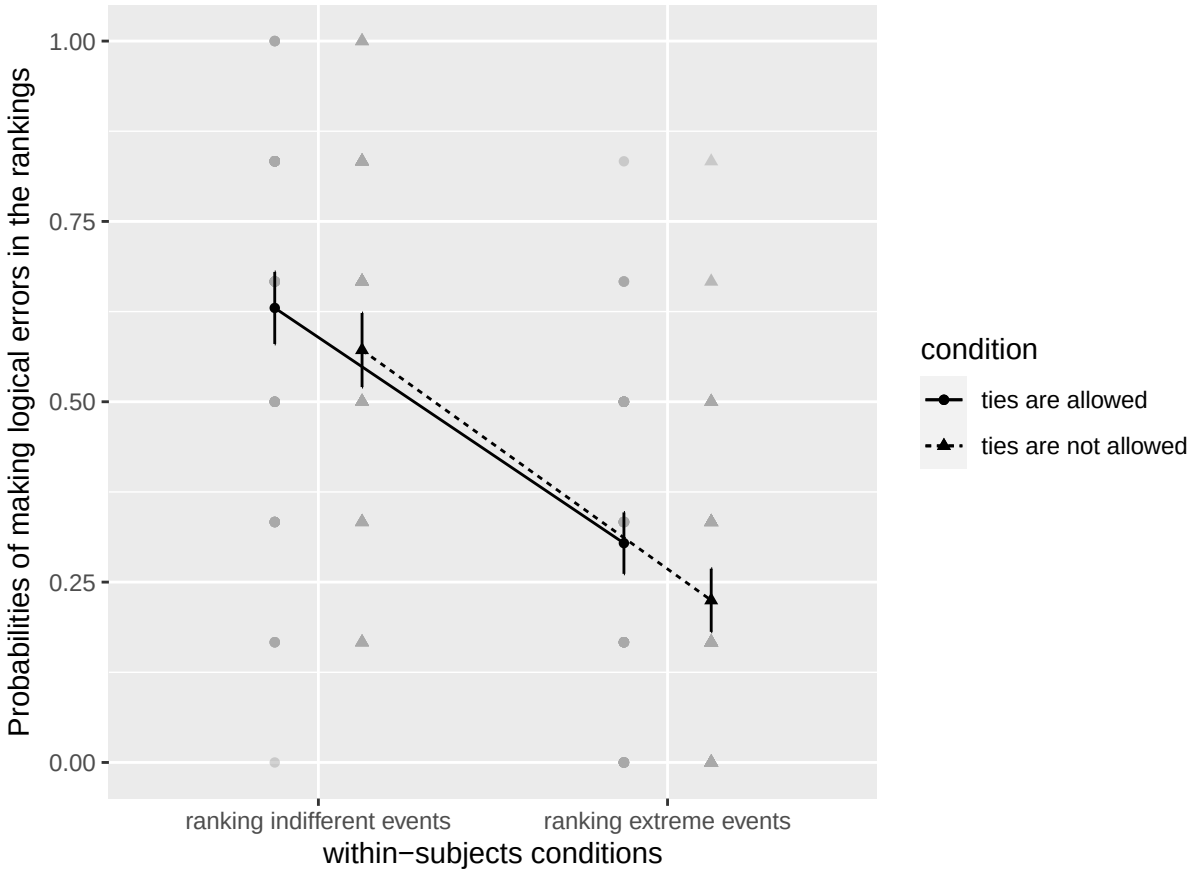
```
a1
```

```
## Anova Table (Type 3 tests)
##
## Response: logical_pass
##          Effect     df  MSE          F   ges p.value
## 1     condition 1, 175 0.07     6.29 *  .023    .013
## 2           con 1, 175 0.03 294.52 ***  .363   <.001
## 3 condition:con 1, 175 0.03       0.28 <.001    .595
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 ' ' 1
```

```
emmeans(a1, c("con", "condition"))
```

```
##  con     condition            emmean     SE  df lower.CL upper.CL
##  indiff  ties are allowed      0.630 0.0253 175    0.580    0.680
##  extreme ties are allowed      0.304 0.0216 175    0.261    0.347
##  indiff  ties are not allowed  0.572 0.0260 175    0.520    0.623
##  extreme ties are not allowed  0.225 0.0222 175    0.181    0.269
##
## Confidence level used: 0.95
```

```
# afex plot
afex_plot(a1, "con", "condition") +
  ylab(expression(paste("Probabilities of making logical errors in the rankings"))) +
  xlab("within-subjects conditions") +
  theme(plot.margin = margin(l = 20)) +
  scale_x_discrete(labels=c("indiff" = "ranking indifferent events", "extreme" = "ranking extreme events
```




```
# people are more error-prone under condition A, where ties are allowed
```

I excluded all the trials where participants gave logically correct answers and ran another ANOVA model to investigate if the probabilities of giving type I errors (conditional on the fact that the response is wrong) differ when participants ranked only extreme events and when they ranked only indifferent events.

Please notice that In type 1 error, participants simultaneously rank one pair of events (i.e., A & not A) over another pair of events (i.e.,B & not B).

Here we only look at the situation where participants are not allowed to give ties. Again, we found a significant main effect of the within-subject condition.

```
a2 <- aov_ez("ID", "error_type", data_clean_B_error,  within  = "con")
a2
```

```
## Anova Table (Type 3 tests)
##
## Response: error_type
##   Effect    df  MSE         F  ges p.value
## 1    con 1, 58 0.04 36.82 *** .201   <.001
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 ' ' 1
```

```
emmeans(a2, "con")
```

```
##  con     emmean     SE df lower.CL upper.CL
##  indiff  0.2831 0.0339 58   0.2153    0.351
##  extreme 0.0613 0.0233 58   0.0147    0.108
##
```

```
## Confidence level used: 0.95
```

```
afex_plot(a2, "con") +
  ylab(expression(paste("Conditional probabilities \n of giving type 1 errors"))) +
  xlab("within-subjects conditions") +
  theme(plot.margin = margin(l = 20)) +
  scale_x_discrete(labels=c("indiff" = "ranking indifferent events", "extreme" = "ranking extreme events
```